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PTO/SB/21 (6-98)
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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	
Filing Date	
First Named Inventor	Andrew J. Cleveland
Group Art Unit	
Examiner Name	
Total Number of Pages in This Submission: 26	
Attorney Docket Number	MLF-600-09

U.S. PTO 09/689157 10/12/00

ENCLOSURES (check all that apply)

- [X] Fee Transmittal Form
  - [X] Fee Attached
- [ ] Amendment / Response
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [X] Assignment Papers (for an Application)
- [X] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition Routing Slip (PTO/SB/69) and Accompanying Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [X] Small Entity Statement
- [ ] Request for Refund
- [ ] After Allowance Communication to Group
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Additional Enclosure(s) (please identify below)

Remarks

09689157 . 101200

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Richard B. Main
Signature	[signature]
Date	10/12/2000

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on this date: 10/12/2000

Typed or printed name	Linda Turnipseed		
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FEE TRANSMITTAL

Patent fees are subject to annual revision on October 1. These are the fees effective October 1, 1997. Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12. See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT ($) 395.

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Andrew J. Cleveland
Examiner Name	
Group / Art Unit	
Attorney Docket No.	MLF-600-09

JC925 U.S. PTO 09/689157 10/12/00

METHOD OF PAYMENT (check one)

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

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☐ Charge Any Additional Fee Required Under 37 C.F.R. §§ 1.16 and 1.17

☐ Charge the Issue Fee Set in 37 C.F.R. § 1.18 at the Mailing of the Notice of Allowance

2. ☒ Payment Enclosed: ☒ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	710	201	355	Utility filing fee	355
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	12	-20** =		X		=	
Independent Claims	3	- 3** =		X		=	
Multiple Dependent						=	

**or number previously paid, if greater; For Reissues, see below

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim, if not paid
109	80	209	40	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 355

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	390	216	195	Extension for reply within second month	
117	890	217	445	Extension for reply within third month	
118	1,390	218	695	Extension for reply within fourth month	
128	1,890	228	945	Extension for reply within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,240	241	620	Petition to revive - unintentional	
142	1,240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	40.
146	710	246	355	Filing a submission after final rejection (37 CFR 1.129(a))	
149	710	249	355	For each additional invention to be examined (37 CFR 1.129(b))	

Other fee (specify) ____________________

Other fee (specify) ____________________

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 395.

SUBMITTED BY			Complete (if applicable)	
Typed or Printed Name	Richard B. Main		Reg. Number	33,258
Signature	[signature]	Date 10/12/2000	Deposit Account User ID	

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Attorney: Richard B. Main, Reg. No.: 33,258
Attorney's Docket No.: MLF-600-09

Applicant or Patentee: Andrew J. Cleveland
Serial or Patent No.:
Filed or Issued: attached
For: POWER CONTROLLER WITH DC ARC-SUPRESSION RELAYS

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS 37 CFR 1.9(f) and 1.27(c) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:

POWER CONTROLLER WITH DC ARC-SUPRESSION RELAYS

described in:

- [x] the specification filed herewith
- [ ] application serial no.: filed:
- [ ] patent no.: issued :

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- [x] no such person, concern, or organization
- [ ] persons, concerns or organizations listed below*:

*Note: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME/ADDRESS:

[ ] individual [ ] small business concern [ ] nonprofit organization

NAME/ADDRESS:

[ ] individual [ ] small business concern [ ] nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the same time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is direct.

Name of inventor: Andrew J. CLEVELAND, USA citizen
Address: 5419 Greenview Court, Reno, NV 89502

Inventor's signature: Andrew J. Cleveland

Date: 10/05/2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Your petitioner, Andrew J. CLEVELAND, a citizen of the United States and a resident of Reno, Nevada, and whose post office address is 5419 Greenview Court, Reno, NV 89502, prays that letters patent may be granted to him for a

POWER CONTROLLER WITH DC ARC-SUPRESSION RELAYS

set forth in the following specification.

POWER CONTROLLER WITH DC ARC-SUPRESSION RELAYS

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates generally to computer network power controllers and more particularly to high-amperage 48-volt DC circuit relay arc-suppression.

Description of the Prior Art

There is a growing need for competitive local exchange carriers to manage remote power control functions of internetworking devices at telephone company (telco) central offices. Competitive local exchange carriers (CLECs), incumbent local exchange carriers (ILECs), independent telephone companies, and other next generation service providers are now all offering a digital subscriber line (DSL) service that promises high-speed Internet access for both homes and businesses. DSL is expected to replace integrated services digital network (ISDN) equipment and lines, and DSL competes very well with the T1 line that has historically been provided by ILECs. A DSL drop costs about $40-60 per month, and is expected to quickly become the dominant subscriber-line technology.

The DSL service is provided by a switch that is co-located in a telco central office, i.e., a digital subscriber line access multiplexer (DSLAM). Many new competitive local exchange carriers are now deploying DSL service in several states. They are installing digital subscriber line access multiplexers in many locations. Such digital subscriber line

access multiplexers are now available from a number of different manufacturers, e.g., Paradyne, Copper Mountain, Ascend, etc.

Nearly all such digital subscriber line access multiplexers are powered by 48-VDC battery power and all have operator console ports. And for emergencies, these DSLAMs usually have two independent 48-VDC battery power supplies, e.g., an A-channel and a B-channel. Most commercial DSLAMs are also controlled by large operating systems that host various application software. Unfortunately, this means most DSLAMs have the potential to fail or lock-up, e.g., due to some software bug.

When a digital subscriber line access multiplexer does lock-up, the time-honored method of recovering is to cycle the power, i.e., reboot. But when a digital subscriber line access multiplexer is located at a telco central office, such location practically prevents it being easy to reboot manually.

There are many large router and ATM switch farms around the country that are equipped by the leading vendors, e.g., Cisco, Bay Networks/Nortel, Ascend, Lucent, Fore, etc. So each of these too has the potential to lock-up and need rebooting, and each of these is very inconvenient to staff or visit for a manual reboot when needed.

Server Technology, Inc., (Sunnyvale, CA) markets a 48-VDC remote power manager and intelligent power distribution unit that provides for remote rebooting of remote digital subscriber line access multiplexers and other network equipment in telco central offices and router farms. The SENTRY 48-VDC is a network management center that eliminates the dispatching of field service technicians to cycle power

and rectify locked-up digital subscriber line access multiplexers.

Statistics show that seventy percent, or more, of all network equipment lock-ups can be overcome by rebooting, e.g., cycling power off and on. A remote power controller, like the SENTRY, can reduce network outages from hours to minutes.

In a typical installation, the telco central office provides the competitive local exchange carriers with bare rack space and a 48-VDC power feed cable that can supply 60-100 amps. The single power input is conventionally distributed through a fuse panel to several digital subscriber line access multiplexers in a RETMA-type equipment rack. Individual fuses in such fuse panel are used to protect each DSLAM from power faults.

But such fuses frequently weld themselves to their sockets in the fuse panel due to loose contacts and high amperage currents. It is ironic therefore that many digital subscriber line access multiplexers do not have power on/off switches. Thus it requires the fuse to be pried out and put back in so the DSLAM can be powered-off for rebooting. But when the fuse is welded, removing the fuse without damaging the fuse panel can be nearly impossible.

The Server Technology SENTRY 48-VDC accepts from the telco or other site host an A-power feed cable and B-power feed cable. Internally, DC-power is distributed to a set of "A" and "B" rear apron output terminal blocks that are protected by push-to-reset circuit breakers. The fuse panel is no longer required. The A-feed and B-feed are then matched to the newer digital subscriber line access multiplexers that also require A-power supply and B-power supply inputs.

Sometimes digital signaling lines can lose the carrier. In such cases, the respective DSLAM must be rebooted to restore the DS3 line. A technician is conventionally required to visit the DSLAM, and use a console port to monitor how the software reboots, and if communications are correctly restored to the DS3.

A SENTRY 48-VDC can be used to remotely power-off the digital subscriber line access multiplexer in the event the carrier is lost. A companion asynchronous communications switch can be used to establish a connection to the DSLAM's console port. Power can be cycled to the DSLAM, and the asynchronous communications switch used to monitor the reboot operation to make certain that the carrier to the DS3 line is restored. The asynchronous communications switch is a low-cost alternative to the expensive terminal server typically used for console port access. The reboot process and the console port monitoring process can both be managed from an operations center, without the need to dispatch technical personnel to the remote location.

The floor space that a competitive local exchange carrier's equipment rack sits upon is very expensive, so the equipment stuffed in the vertical space in a rack ("U-space") must be as compact as possible. A typical rack may house several digital subscriber line access multiplexers, a terminal server, a fuse panel, and 48-VDC modems. A SENTRY 48-VDC uses "3U" (5.25 inches) of vertical RETMA-rack space, and combines the functions of a fuse panel, a terminal server, and a modem. As many as eight 20-amp devices, or four 35-amp devices can be supported.

Power controllers, like the Server Technology SENTRY, use electromechanical relays to open and close the 48-volt supply lines to the network equipment. Unfortunately, the

same physical phenomena that welds the fuses in their holders can also weld or destroy the contacts of these relays.

Most electric welders generate the high heats necessary to fuse metal together by arcing a direct current (DC) low voltage (under 50-volts) and high current (over 50-amps) across an electrode gap. Such conditions occur in a power controller's relay, especially when the relay contacts are opening. The mass inertia of the contact mechanism has to be overcome before the contacts can open. The contacts accelerate apart, but are moving only very slowly at the start. Electric arcs, once generated, will continue even though the electrode separation distance is increased. This is the so-called Jacob's Ladder effect. The ionized air and the heated contacts increase the distance an arc can bridge. The arcing stops only after the contacts are very wide apart.

In contrast, a pair of open relay contacts will not arc until the contacts get very close to one another. By this time, the contact closure is moving at its near maximum velocity. So the remaining gap that needs to be closed up when the arc commences will vanish quickly.

SUMMARY OF THE PRESENT INVENTION

It is therefore an object of the present invention to provide a DC arc-suppressor for network appliance power managers.

It is another object of the present invention to provide a power controller with long-lasting and reliable relay operation.

Briefly, a DC arc-suppressor embodiment of the present invention for network appliance power managers comprises an

electromechanical relay that controls the flow of battery power to a network appliance by remote control. The relay includes electrical contacts that open to interrupt the flow of current in response to an off-command signal. A transistor is connected in shunt across the relay contacts to temporarily divert such flow of current. A timing circuit is connected to respond to the off-command signal by first turning on the shunt transistor, then open the relay contacts, then turn off the shunt transistor. Such shunt transistor is sized to carry the full rated power of the relay contacts, but only for the few milliseconds that are needed to allow the relay contacts to fully separate.

An advantage of the present invention is that a DC arc-suppressor is provided for network appliance power managers.

Another advantage of the present invention is that a power controller is provided for network appliances.

These and many other objects and advantages of the present invention will no doubt become obvious to those of ordinary skill in the art after having read the following detailed description of the preferred embodiments which are illustrated in the various drawing figures.

IN THE DRAWINGS

Fig. 1 is schematic diagram of a power controller embodiment of the present invention that includes a DC arc-suppression circuit;

Fig. 2 is a timing diagram related to various signal points in Fig. 1; and

Fig. 3 is a functional block diagram that shows a dual-source battery power manager wired to power-cycle DSLAM, routers, and other network devices.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 illustrates a power controller embodiment of the present invention, referred to herein by the general reference numeral 100. The power controller 100 connects to a computer data network 102, e.g., the Internet, and can send status and receive commands with a network client 104. A power-OFF command raises a signal line 105 and triggers a one-shot multivibrator 106. A twenty millisecond long pulse is fed to an opto-isolator 108 through a dropping resistor 110. This turns-on a power metal-oxide-semiconductor field-effect transistor (MOSFET) 111.

The raising of signal line 105 by the power-OFF command also is fed through a two-millisecond delay circuit 112 and is forwarded to another opto-isolator 114 through a dropping resistor 116. A switch transistor 115 turns-on and energizes an inductive armature 118 in an electro-mechanical relay.

A set of station batteries 120, e.g., a 48-volt bank at a Telco Central Office, are connected through a master switch 122 and a pair of normally closed relay contacts 124 to a load 126. Network routers, bridges, and other computer network equipment are examples of what is represented by load 126. A suppression diode 128 helps control transients that occur across the load during the operation of the relay contacts 124. A sense resistor 130 is useful for the monitoring of load currents with a voltmeter or oscilliscope.

A conventional arc-suppression network comprising a capacitor 132, a resistor 134, and a diode 136, are connected across the relay contacts 124 to help control arcing and contact burning.

Fig. 2 illustrates some of the critical signal timing that occurs in power controller 100 during operation. A signal-A 202 corresponds to the output of the network client 104, e.g., signal line 105. A signal-B 204 corresponds to the load output current, as seen as a voltage across sense resistor 130. A signal-C 206 corresponds to the output of the one-shot multivibrator 106. A signal-D 208 corresponds to the output of the delay circuit 112 as seen by the dropping resistor 116.

During operation, at a time t0, the power controller 100 is energized. At a time t1, the network client 104 receives a power-OFF command, and signal-A 202 is raised. This triggers the one-shot multivibrator 106 and causes a twenty millisecond pulse output to appear as signal-C 206. Such turns-on MOSFET power transistor 111. The signal-A 202 being raised also causes signal-D 208 to follow suit, but with a two millisecond delay. Such energizes relay 118 and pulls open contacts 124. The rising-edge delay of two-milliseconds is represented by the slope of signal-D between times t1 and t2. Signal-B 204 automatically falls back at time t3. The MOSFET power transistor 111 turns off, having done its job of shunting the load current while the relay contacts were breaking.

At time t4, the network client 104 receives a power-ON command, and signal-A 202 is lowered. This causes signal-D 208 to drop and the relay contacts 124 close at time t5. The one-shot multivibrator 106 is unaffected because it is positive-edge triggered only.

The one-shot multivibrator 106 can be implemented with a National Semiconductor NE555. The opto-isolatores 108 and 114 can comprise photo-relays.

Fig. 3 represents a system 300 that includes a dual 100-amp battery source power manager 302 wired to power-cycle two DSLAMs 304 and 305, four routers 306, 307, 308 and 309, and two generic network devices 310 and 311.

The chassis are all mounted in a single RETMA-rack 312. An A-channel power connector 314 and a B-channel power connector 316 on the power manager 302 receive two circuits of 48-volt DC battery power from a telco site. A pair of batteries 318 and 320 represent these sources. A plurality of power control modules 322-329 internal to the power manager 302 are independently controlled from a network connection 330 and can individually control A-channel and B-channel DC-power supplied to each DSLAM 304 and 305, routers 306, 307, 308 and 309, and generic network devices 310 and 311. Such power control modules 322-329 include the DC arc-supression circuitry of Fig. 1.

When any of the DSLAMs 304 and 305, routers 306, 307, 308 and 309, and generic network devices 310 and 311 need to be remotely rebooted, an appropriate network data is sent to the responsible power control modules 322-329 to cause both A-channel and B-channel DC power to cycle off and on.

Although the present invention has been described in terms of the present embodiment, it is to be understood that the disclosure is not to be interpreted as limiting. Various alterations and modifications will no doubt become apparent to those skilled in the art after having read the above disclosure. Accordingly, it is intended that the appended claims be interpreted as covering all alterations and

modifications as fall within the true spirit and scope of the invention.

What is claimed is:

IN THE CLAIMS

1. A DC-arc suppression circuit, comprising:

an electro-mechanical relay with a relay contact providing for direct current (DC) electricity to be controlled between a power source and an electrical load, and further comprising an inductive armature to open and close said relay contact;

a power transistor connected in electrical shunt with said relay contact and having an input for controlling a shunt current;

a timing circuit connected to said inductive armature and said input of the power transistor; and

a power-control signal input connected to the timing circuit;

wherein, when the timing circuit receives a command from the power-control signal input to interrupt a flow of power from said power source to said electrical load, it first turns on the power transistor, then opens said relay contact, and lastly turns off the power transistor.

2. The DC-arc suppression circuit of claim 1, wherein:

when the timing circuit receives a command from the power-control signal input to close-circuit a flow of power from said power source to said electrical load, it simply causes said relay contact to close and does not operate the power transistor.

3. The DC-arc suppression circuit of claim 1, wherein:

the power transistor is a MOSFET-type with its drain and source electrodes connected in parallel to said relay contact.

4. The DC-arc suppression circuit of claim 1, wherein:

the timing circuit is such that it includes a switch transistor to electrically control said inductive armature.

5. The DC-arc suppression circuit of claim 1, wherein:

the timing circuit is such that it provides about a two millisecond delay between a signal at the power-control signal input and its resulting operation of the relay.

6. The DC-arc suppression circuit of claim 1, wherein:

the timing circuit is such that it provides about a twenty millisecond long switch-ON pulse to the power transistor beginning at the arrival of an OFF-command signal at the power-control signal input.

7. The DC-arc suppression circuit of claim 1, wherein:

the power transistor is a MOSFET-type with its drain and source electrodes connected in parallel to said relay contact; and

the timing circuit is such that it includes a switch transistor to electrically control said inductive armature, and it provides about a two millisecond delay between a signal at the power-control signal input and its resulting operation of the relay, and it further provides about a twenty millisecond long switch-ON pulse to the power

transistor beginning at the arrival of an OFF-command signal at the power-control signal input.

8. A remote power controller, comprising:

a network client for sending and receiving power status and power control messages over a computer data network;

an electro-mechanical relay with a relay contact providing for direct current (DC) electricity to be controlled between a power source and an electrical load, and further comprising an inductive armature to open and close said relay contact;

a power transistor connected in electrical shunt with said relay contact and having an input for controlling a shunt current;

a timing circuit connected to receive a decoded power-ON command and a power-OFF command from the network client; and

wherein, when the timing circuit receives said power-OFF command to interrupt a flow of power from said power source to said electrical load, it first turns on the power transistor, then opens said relay contact, and then turns the power transistor back off.

9. The remote power controller of claim 8, wherein:

when the timing circuit receives a command from the power-control signal input to close-circuit a flow of power from said power source to said electrical load, it simply causes said relay contact to close and does not operate the power transistor.

10. The remote power controller of claim 8, wherein:

the power transistor is a MOSFET-type with its drain and source electrodes connected in parallel to said relay contact.

11. The remote power controller of claim 8, wherein:

the power transistor is a MOSFET-type with its drain and source electrodes connected in parallel to said relay contact; and

the timing circuit is such that it includes a switch transistor to electrically control said inductive armature, and it provides about a two millisecond delay between a signal at the power-control signal input and its resulting operation of the relay, and it further provides about a twenty millisecond long switch-ON pulse to the power transistor beginning at the arrival of an OFF-command signal at the power-control signal input.

12. A method for reducing the arcing of relay contacts carrying direct current electrical flows, the method comprising the steps of:

shunting a current around a pair of contacts in an electro-mechanical relay through a solid-state semiconductor device to clamp the open-circuit voltage across said pair of contacts under load;

opening said pair of contacts in said electro-mechanical relay; and

turning off said solid-state semiconductor device to unclamp the open-circuit voltage across said pair of contacts under load;

wherein, any tendency of said pair of contacts in said electro-mechanical relay to arc when being opened is suppressed.

ABSTRACT OF THE DISCLOSURE

A DC arc-suppressor for network appliance power managers comprises an electromechanical relay that controls the flow of battery power to a network appliance by remote control. The relay includes electrical contacts that open to interrupt the flow of current in response to an off-command signal. A transistor is connected in shunt across the relay contacts to temporarily divert such flow of current. A timing circuit is connected to respond to the off-command signal by first turning on the shunt transistor, then open the relay contacts, then turn off the shunt transistor. Such shunt transistor is sized to carry the full rated power of the relay contacts, but only for the few milliseconds that are needed to allow the relay contacts to fully separate.

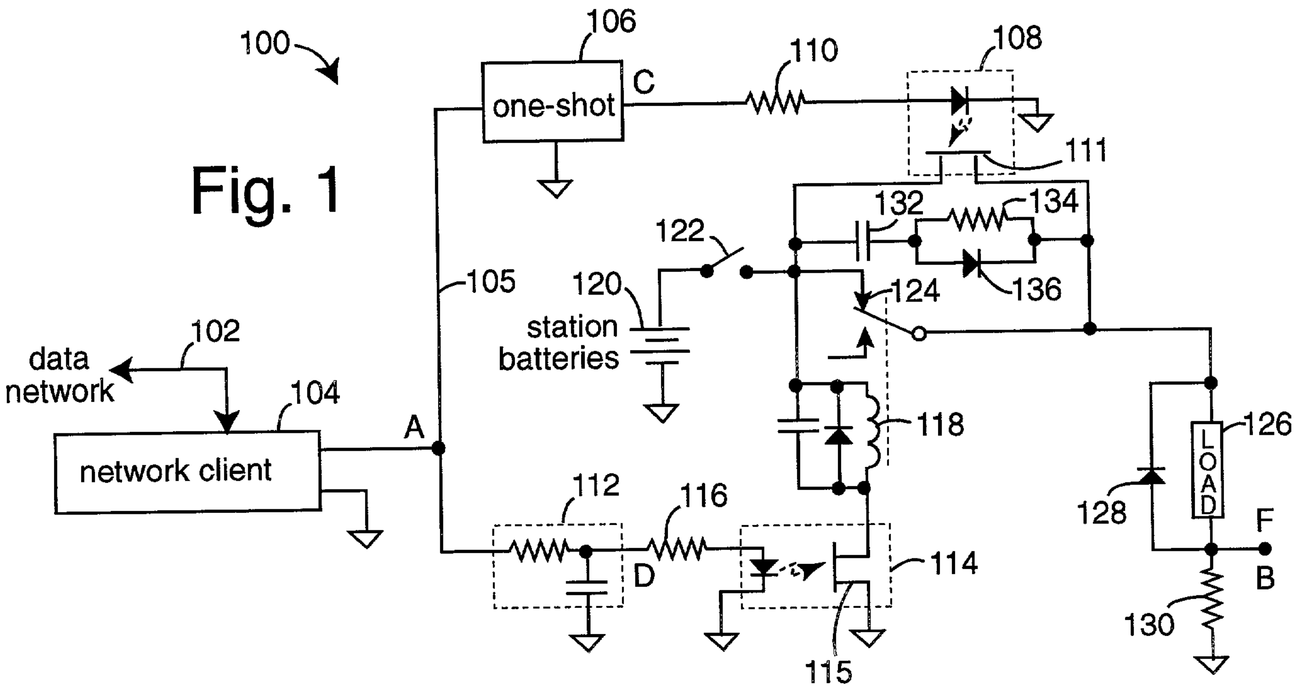
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Fig. 1

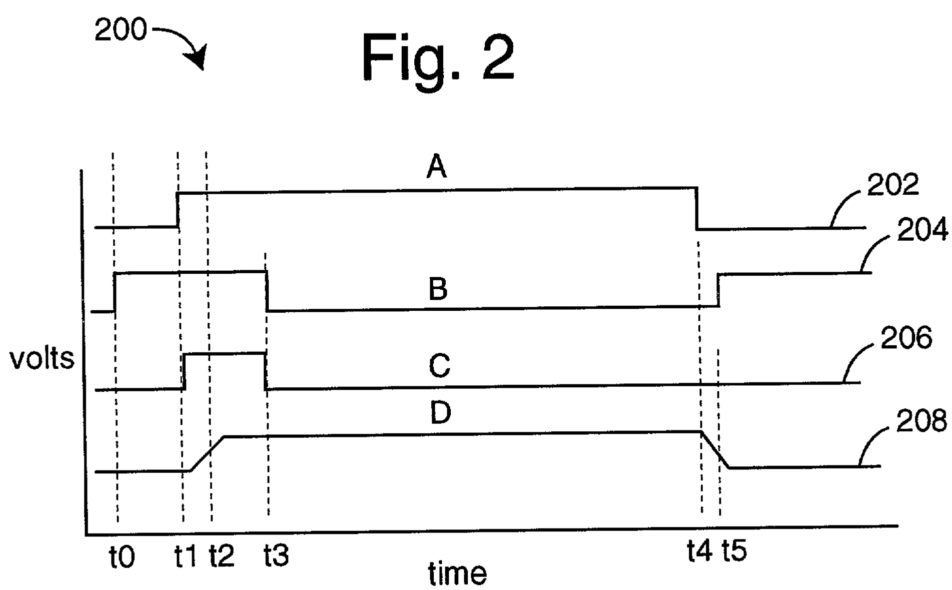
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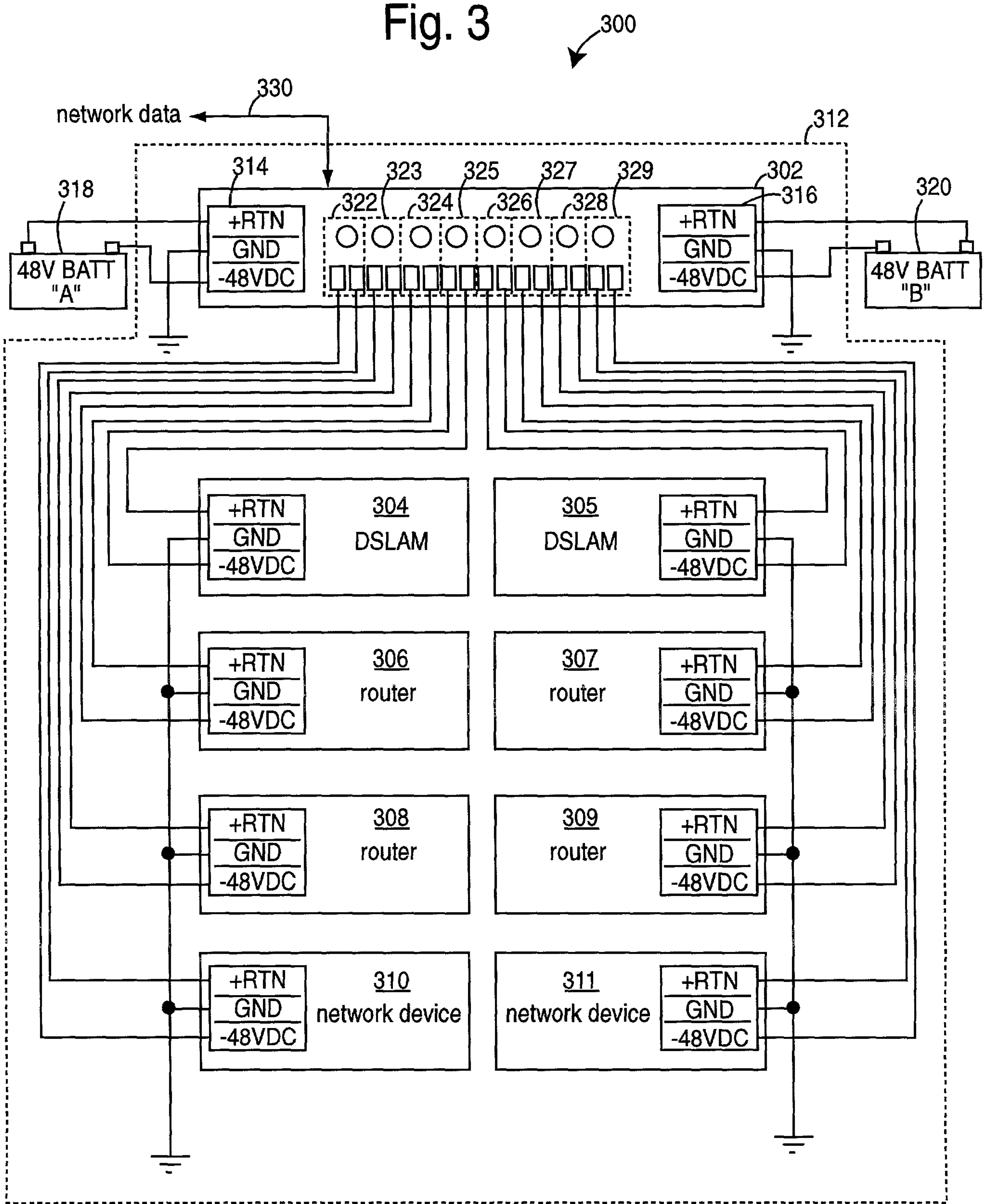
Fig. 2

Fig. 3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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☒ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	MLF-600-09
First Named Inventor	Andrew J. CLEVELAND
COMPLETE IF KNOWN	
Application Number	/
Filing Date	
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

POWER CONTROLLER WITH DC ARC-SUPRESSION RELAYS

(Title of the Invention)

the specification of which

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) [ ] as United States Application Number or PCT International Application Number [ ] and was amended on (MM/DD/YYYY) [ ] (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	
60/224,387	08/09/2000	☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

Please type a plus sign (+) inside this box → [X]

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DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number *(if applicable)*

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☐ Customer Number [ ] → *Place Customer Number Bar Code Label here*
OR
☒ Registered practitioner(s) name/registration number listed below

Name	Registration Number	Name	Registration Number
Richard B. Main	33,258		

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☐ Customer Number or Bar Code Label [ ] *OR* ☒ Correspondence address below

Name	Richard B. Main				
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Address	24441 Mines Road				
City	Livermore	State	CA	ZIP	94550
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
Andrew J.	CLEVELAND

Inventor's Signature	Andrew J. Cleveland					Date	10/05/2000
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City	Reno	State	NV	ZIP	89502	Country	USA

☒ Additional inventors are being named on the ____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto